REMARKS

This amendment is responsive to the non-final Office Action issued May 27, 2009. Reconsideration and allowance of **claims 1-7, 9-10, 12, 14-15, and 17-24** are requested.

The Office Action

Claims 1, 3, 4, 12, and 17 were objected to.

Claims 1-10 and 12-19 were rejected under 35 U.S.C. § 112, second paragraph.

Claims 1 and 14 were rejected under 35 U.S.C. § 102(b) as being anticipated by Krause et al. (U.S. Patent No. 6,701,174).

Claims 2, 3, 12, 13, and 16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Krause et al. in view of Newell et al. (U.S. Patent No. 6,911,980).

Claims 2, 3, 12, 13, and 16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Krause et al. in view of Newell et al. and further in view of Ohba (U.S. Patent No. 4,885,702).

Claims 15 and 17 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Krause et al. in view of Gauthier (U.S. Patent Application Publication No. 2004/0012641).

Claims 2, 3, 12, 13, and 16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Krause et al. and Gauthier in further view of Newell et al. and further in view of Ohba.

Claims 20 and 21 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Krause et al. in view of Chaney et al. (U.S. Patent No. 5,926,568).

The Present Application

The present application is directed to a scanner that acquires images of a subject. A 3D model of an organ is selected from an organ model database and dropped over a 3D image of an actual organ. A best fitting means globally scales, translates and/or rotates the model to best fit the actual organ represented by the image. A user uses a mouse to use a set of manual tools to segment and manipulate the model to match the image data more closely. The set of tools includes: a Gaussian tool for deforming a surface portion of the model along a Gaussian curve, a spherical

push tool for deforming the surface portion along a spherical surface segment, and a pencil tool for manually drawing a line or line segments to which the surface portion is redefined.

The above description of the present application is presented to the Examiner as background information to assist the Examiner in understanding the application. The above description is not used to limit the claims in any way.

The References of Record

Krause et al. discloses a computer assisted orthopedic surgery planner software for generation of 3D solid bone models from two or more 2D X-ray images of a patient's bone. For example, two orthogonal 2D X-ray projection images or shadow grams of the target bone. In order to reconstruct a 3D depiction of the target bone with this insufficient amount of image, Krause fits a 3D bone to the projections of the bone in the two 2D projection images. The software reconstructs the bone contours by starting with a 3D template bone and deforming the 3D template bone to substantially match the geometry of the patient's bone in the two 2D X-ray images. A surgical planner and simulator module of the computer assisted orthopedic surgery planner software generates a simulated surgery plan showing the animation of the bone distraction process, the type and the size of the fixator frame to be mounted on the patient's bone, the frame mounting plan, the osteotomy/coricotomy site location and the day-by-day length adjustment schedule for each fixator strut.

Newell et al. discloses a shape manipulation method, relocation information is received indicative of an intended change in position of a target location on a curve or surface shape, the contour of the curve or surface shape being governed by control points. In response to the relocation information, new positions are determined for canonical locations on the shape based on predefined intended behaviors of the canonical locations.

Ohba discloses a method and apparatus for interactively generating and visually displaying deformed, free curved surfaces using a computer aided display apparatus by designating a desired deformation area, including an action point, on a non-deformed surface, determining a vector field function at each point within the deformation area; designating a deformation vector at the action point; adding the position vector P to the position vector to generate a position vector; and visually displaying the deformed curved surface represented by the position vector.

Gauthier et al. discloses a system that generates, modifies, and animates three dimensional data. A representation of an existing 3D entity is displayed and a further entity is selected from a menu in response to manual operation of an input device. A user drags and drops the selected entity over the existing entity and the default operation is performed in order to create new data relevant to the entity association. If necessary a user is prompted for additional information when it is possible to perform more than one default operation.

Chaney et al. discloses a method, system, and computer program for automatic image recognition of standard shapes which include a core-based deformable skeletal grid used to define and represent an object via a model template. The template includes deformable segments, the changes of which are measurable against the deformed model corresponding to an object in a subsequent image. Statistical correlation techniques optimize the match to further refine the shape of the subsequent image.

Claim Objections

Claims 1, 3, 4, 12, and 17 have been amended to address the claim objections.

35 U.S.C. § 112, Second Paragraph

Claims 1-10 and 12-19 have been amended to address the 35 U.S.C. § 112, second paragraph rejections.

The Claims Distinguish Patentably Over the References of Record

Claims 1 and 14 are not anticipated by Krause et al. Applicants respectfully submit that this rejection is improper and/or erroneous. Accordingly, the rejection is hereby traversed.

More specifically, regarding **claim 1**, Krause et al. does not disclose a reconstruction processor for reconstructing the image data into a three dimensional (3D) image representation of the organ or a set of global tools for best fitting the selected shape model to the 3D image representation of the organ or a set of manual tools for modifying selected regions of the selected shape model to precisely match the 3D image representation of the organ. The Office Action refers Applicant to

Col. 11 lines 14-16, Col. 12 lines 4-7, 21-29, 42-46, and Col. 12 line 66 – Col. 13 line 15 which discloses an orthopedic surgery planner for adapting 3D bone models from two or more 2D X-ray projection images of a patient's bone. More specifically, Krause et al. discloses scaling and deforming a predefined three-dimensional bone shape template until the bone shape template gives an image similar to each of the 2D X-ray images when projected onto a corresponding two dimensional plane. The positioning and scaling parameters are optimized for the bone template until the size and position of the bone template matches the patient's bone judged from the patient's X-ray images. Krause et al. does not disclose acquiring image data of an organ and reconstructing the image data into a three-dimensional image representation of the organ. Additionally, Krause et al. does not disclose best fitting a selected model to the three-dimensional image representation and using manual tools for modifying regions of the model to precisely match the model to the three dimensional image representations.

Further, the Office Action asserts that Krause et al. discloses a set of manual tools for modifying regions of the shape model to match the three dimensional image representation. Krause et al. discloses a free-form deformation process which is applied to the bone template to optimally match the template with the patient's bone. The Barr and Parry techniques deform the template using stretching, bending, twisting, and taper operators. Krause et al. discloses using a hierarchical and recursive refinement with these operators to adjust the deformation of the bone template. After a first deformation process of the bone template is complete, an error is calculated by projecting the bone template to one of the X-ray images. Based on the error calculated, the free-form deformation parameters are optimized and the bone template deformation is adjusted once again. The process is continued for each X-ray projection image until the error between the bone template and each of the 2D X-ray images is minimized. Krause et al. does not disclose manually modifying regions of the shape model to precisely match the three dimensional image representation.

Moreover, Krause et al. does not disclose a set of manual tools for modifying a shape model. Krause et al. discloses a graphically user interface that allows a user to manipulate the three dimensional simulations. The user interface is used to alter the proposed surgical plan which uses the deformed bone template. Krause et al. does not disclose using the user interface for modifying the shape model to precisely match the three dimensional image representation. It is respectfully

submitted that Krause et al. does not disclose reconstructing image data into a three dimensional (3D) image representation of a organ, best fitting a selected shape model to the 3D image representation of the organ, and using a set of manual tools for modifying selected regions of the selected shape model to precisely match the 3D image representation of the organ.

Accordingly it is submitted that independent **claim 1** and **claims 2-7, 9-10, 12, and 14-15** that depend therefrom distinguish patentable over the references of record.

Claims 15 and 17 are patentable over Krause et al. in view of Gauthier. Applicants respectfully submit that this rejection is improper and/or erroneous. Accordingly, the rejection is hereby traversed.

Claim 17 calls for reconstructing the image data into a three dimensional (3D) image representation of the object; dragging and dropping a selected 3D model on the 3D image representation of the object; and deforming local regions of the 3D model with a set of manual tools to match the 3D model to the 3D image representation of the object. Gauthier discloses a system and process to drop and drag three dimensional icons, e.g. a basketball into a scene on a display. It is submitted that Gauthier goes to enablement by showing how to drag and drop but does not put the reader in possession of the idea to use the drag and drop techniques to select a best fit model for use in model fitting nor dragging the 3D model to improve the fit much less translating, scaling, or rotating. It is respectfully submitted that neither Krause et al., nor Gauthier, nor the combination thereof, teach or fairly suggest manually deforming regions of a three dimensional model to precisely match a three dimensional image representation of an object.

Accordingly it is submitted that independent **claim 17** and **claims 18-19** that depend therefrom distinguish patentable over the references of record.

Claims 20 and 21 are patentable over Krause et al. in view of Chaney et al. Applicants respectfully submit that this rejection is improper and/or erroneous. Accordingly, the rejection is hereby traversed.

Claim 20 calls for applying manual shape-altering tools to the best-fit model such as to modify the model to conform to the image data. Krause et al. discloses a graphically user interface that allows a user to manipulate a three dimensional surgical plan simulation but does not disclose using the interface to effect

fitting a model manually. Chaney et al. discloses using statistical correlation techniques to deform standard shape models in order to match the shape model to an object in an image. It is respectfully submitted that neither Krause et al., nor Chaney et al., nor the combination thereof, teach or fairly suggest modifying and fitting a shape model to conform to image data using manual shape altering tools.

Accordingly it is submitted that independent **claim 20** and **claims 21-24** that depend therefrom distinguish patentable over the references of record.

CONCLUSION

For the reasons set forth above, it is submitted that **claims 1-7, 9-10, 12, 14-15, and 17-24** (all claims) distinguish patentably over the references of record and meet all statutory requirements. An early allowance of all claims is requested.

In the event the Examiner considers personal contact advantageous to the disposition of this case, the Examiner is requested to telephone Thomas Kocovsky at 216.363.9000.

Respectfully submitted,

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